Patent Claims:

1. A projection objective for short wavelengths, in particular for wavelengths $\lambda < 157$ nm, having a number of mirrors that are arranged positioned precisely in relation to an optical axis, and wherein the mirrors have multilayer coatings, characterized in that there are provided for the mirrors at least two different mirror materials that differ in the rise in coefficient of thermal expansion as a function of the temperature in the region of the zero crossing of the coefficients of thermal expansion, in particular in the sign of the rise.

2. The projection objective as claimed in claim 1, characterized in that a rise in coefficients of thermal expansion of below 100 ppb/K^2, in particular below 10 ppb/K^2, in absolute terms is provided.

3. The projection objective as claimed in claim 1 or 2, characterized in that the zero crossing temperature is located in a range between 0 to 100°C, in particular between 10 to 50°C.

4. The projection objective as claimed in claim 1, characterized by use in the EUV region with wavelengths $\lambda < 20$ nm.

5. The projection objective as claimed in claim 1, characterized in that at least one mirror (M1, M2, M3, M4, M5, M6) made from a glass ceramic material is provided, and at least one mirror (M1, M2, M3, M4, M5,

M6) made from an amorphous titanium silicate glass is provided.

6. The projection objective as claimed in claim 5, characterized in that the glass ceramic material is ZERODUR®.

7. The projection objective as claimed in claim 5, characterized in that the amorphous titanium silicate glass is ULE®.

8. The projection objective as claimed in claim 5, characterized in that the glass ceramic material is provided for mirrors with large beam cross sections.

9. The projection objective as claimed in claim 5, characterized in that the glass ceramic material is provided for mirrors in the objective region remote from the wafer.

10. The projection objective as claimed in claim 1, characterized by an assembly of mirrors (M1, M2, M3, M4, M5, M6) that are arranged with regard to their mirror materials in a fashion minimizing thermally induced aberrations.

11. The projection objective as claimed in claim 1, characterized by an assembly of mirrors (M1, M2, M3, M4, M5, M6) that are arranged with regard to their mirror materials so as to optimize a scattered light distribution in a wafer plane (3).

12. The projection objective as claimed in claim 1, characterized by an assembly of mirrors (M1, M2, M3, M4, M5, M6) that are arranged with regard to their mirror materials in such as a way as to provide a minimization of wavefront errors caused by CTE inhomogeneities.

13. A projection exposure apparatus for EUV lithography comprising optical components, in particular mirrors, reticles or beam splitters, characterized in that provided for the optical components (M1, M2, M3, M4, M5, M6) are at least two different substrate materials that differ in the rise of the coefficient of thermal expansion as a function of temperature in the region of zero crossing of the coefficients of thermal expansion, in particular in the sign of the rise.

14. The projection exposure apparatus as claimed in claim 13, characterized in that a rise in coefficients of thermal expansion of below 100 ppb/K^2, in particular below 10 ppb/K^2, in absolute terms is provided.

15. The projection exposure apparatus as claimed in claim 13 or 14, characterized in that the zero crossing temperature has a range of between 0 to 100°C, in particular between 10 to 50°C.

16. The projection exposure apparatus as claimed in claim 13, characterized in that at least one optical component (M1, M2, M3, M4, M5, M6) made from a glass ceramic material is provided, and at least one optical component (M1, M2, M3, M4, M5, M6) made from an amorphous titanium silicate glass is provided.

17. The projection exposure apparatus as claimed in claim 13, characterized by an assembly of optical components (M1, M2, M3, M4, M5, M6) that are arranged with regard to their substrate materials in a fashion reducing thermally induced aberrations.

18. The projection exposure apparatus as claimed in claim 13, characterized by an assembly of optical components (M1, M2, M3, M4, M5, M6) that are arranged with regard to their substrate materials so as to optimize a scattered light distribution in a wafer plane (3).

19. The projection exposure apparatus as claimed in claim 13, characterized by an assembly of optical components (M1, M2, M3, M4, M5, M6) that are arranged with regard to their substrate materials in such as a way as to provide a minimization of wavefront errors caused by CTE inhomogeneities.

20. An X-ray optical subsystem, in particular mirror, reticle or beam splitter, for X-radiation of wavelength λ_R, characterized by at least two different substrate materials that differ in the rise in coefficient of thermal expansion as a function of temperature in the region of the zero crossing of the coefficients of thermal expansion, in particular in the sign of the rise.

21. The X-ray optical subsystem as claimed in claim 20, characterized in that the wavelength $\lambda_R < 200$ nm, in particular $\lambda_R < 157$ nm.

22. The X-ray optical subsystem as claimed in claim 20, characterized in that the substrate material is a glass ceramic material.

23. The X-ray optical subsystem as claimed in claim 20, characterized in that the substrate material is a titanium silicate glass.

24. An X-ray optical subsystem for a projection objective in accordance with one of claims 8 to 12.

25. Use of X-ray optical subsystems as claimed in one of claims 20 to 23 in X-ray microscopy, X-ray astronomy or X-ray spectroscopy.